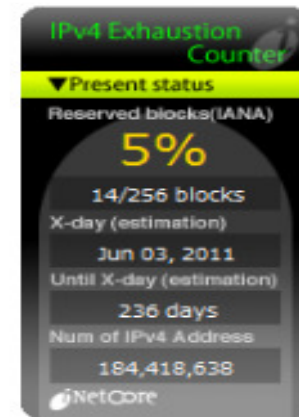


## IPv6 Global Overview



*Riyadh, Saudi Arabia  
October 10<sup>th</sup> 2010*

*This report is intended for internal use by RTC. Its contents should not be passed to, or discussed with any external party without the formal written approval of RTC.*

## There is a global political support for IPv6

- ✚ **OECD - Organization of Economic Cooperation and Development**
  - June 2008 - Seoul Declaration for the Future of the Internet Economy: 40 Ministers (including representatives from China and India) highlighted the importance of encouraging IPv6 adoption, in particular through its deployment by private sector and by governments.
  
- ✚ **ITU - International Telecommunications Union**
  - Johannesburg 2008 - Member States and Sector Members reached consensus and adopted Resolution 64 'IP address allocation and encouraging the deployment of IPv6' to promote awareness of the availability of IPv4 addresses and the deployment of IPv6.
  
- ✚ **NTIA - National Telecommunications and Information Administration**
  - 28<sup>th</sup> September 2010 - Impact of the Adoption & Deployment of IPv6 Addresses for Industry, U.S. Government, and the Internet Economy
  - May 2009 - Planning Guide/Roadmap Toward IPv6 Adoption within the US Government
  - October 2008 - Internet of the Future: "A wide spread transition to IPv6 requires broader international cooperation."
  
- ✚ **EC - European Commission**
  - 2010 - European Digital Agenda successor of the i2010 initiative): includes IPv6 as a priority
  - May 2008 - Advancing the Internet: Action Plan for the deployment of IPv6 in Europe
  
- ✚ **CNGI - China Next Generation Internet**
  - Summer 2008 - China showcased CNGI's IPv6 infrastructure at the 2008 Olympic Games in Beijing

**Numerous regional and national initiatives related to IPv6 development  
are currently being carried on**

Source: OECD 2008,, NTIA 2008 & 2010, European Commission 2008

## IPv4 allocation imbalance and different Internet usage growth result into IPv6 urgency being viewed differently

	APNIC	RIPE	ARIN	AfriNIC	LACNIC
# IPv4 allocated (%)	570 million (33%)	503 million (29%)	520 million (30%)	34 million (2%)	100 million (6%)
# IPv4 used	540 million	450 million	486 million	17 million	79 million
# IPv4 available	30 million	53 million	34 million	17 million	21 million
# inhabitants	3,434 million	1,025 million	360 million	1,013 million	592 million
# Internet users	825 million	538 million	260 million	110 million	204 million
# IPv4 addresses allocated by inhabitant	0.17 address / inhabitant	0.49 address / inhabitant	1.44 address / inhabitant	0.03 address / inhabitant	0.17 address / inhabitant
# IPv4 addresses allocated by Internet users	0.69 address/ Internet user	0.93 IP address/ Internet user	2 addresses/ Internet user	0.31 address/ Internet user	0.49 address/ Internet user

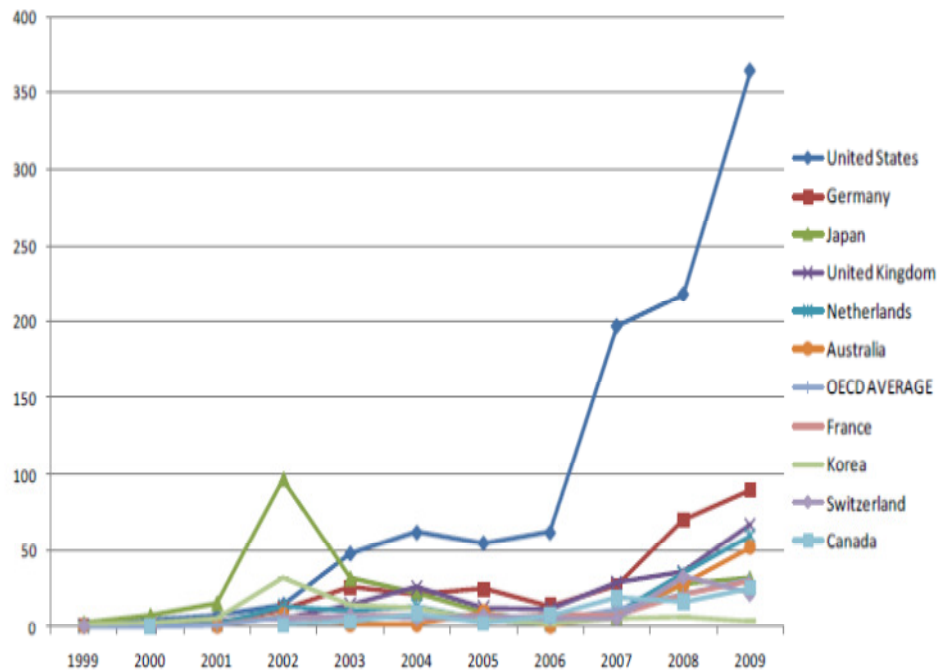
**The large number of IPv4 addresses allocated to the ARIN region might explain why major global content and hosting providers have been late at providing IPv6-based services**

Source: Red Tech Consulting analysis, APNIC, RIPE, ARIN, AfriNIC, LACNIC

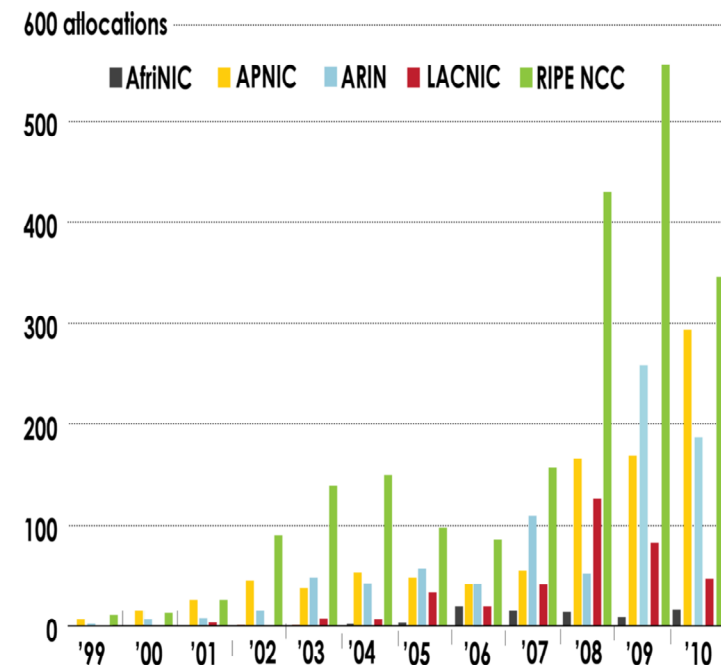
# Red Tech Consulting

Since 2007, IPv6 allocations have grown beyond initial allocations

Growth per country



Growth per region



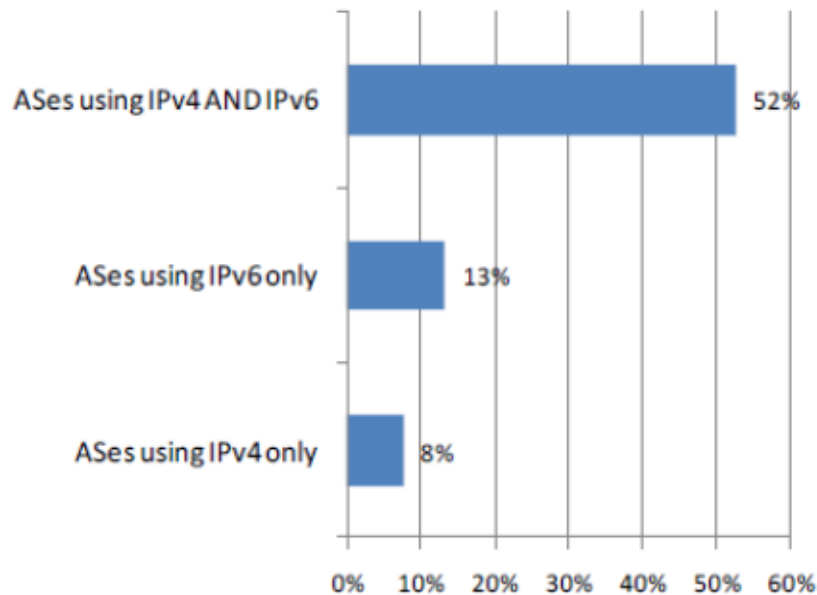
**In 2009 USA was the largest recipient country of IPV6 addresses before Germany  
RIPE was the largest recipient region**

Source: OECD 2010, NRO 2010

## Autonomous Systems (ASes) using IPv4 and IPv6 grew more than 50% in 2009

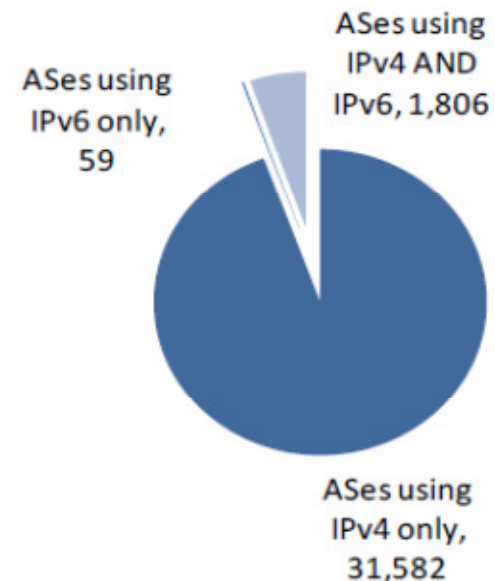
Yearly growth rate of IPv4 and IPv6 ASes (networks)

Year-end 2009



Total number of IPv4 and IPv6 ASes (networks)

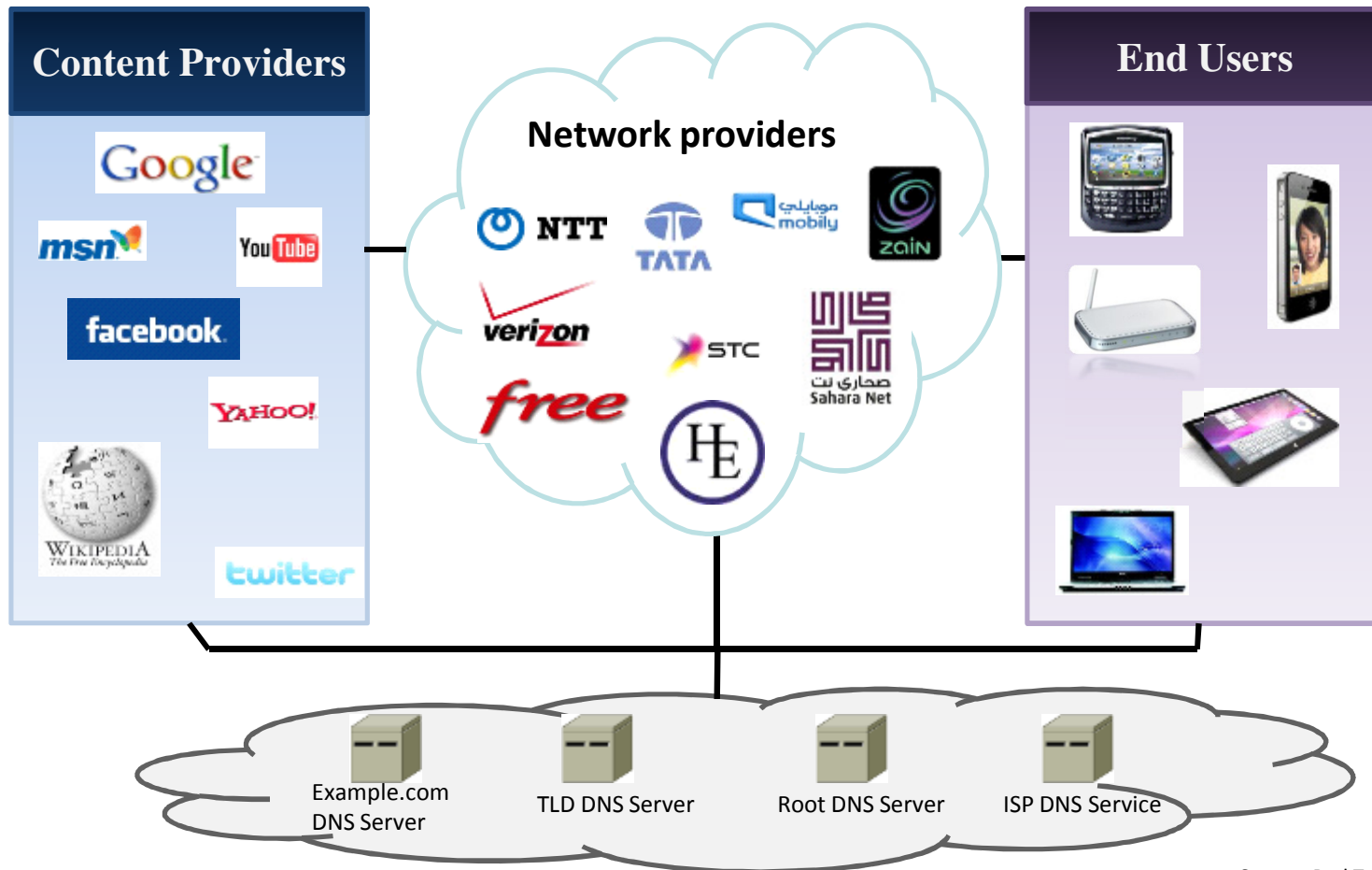
Year-end 2009



**1865 networks in total supported IPv6 by year-end 2009,  
i.e. 5.6% of the total networks up from 1200 in 2008 and 900 in 2007**

Source: OECD April 2010

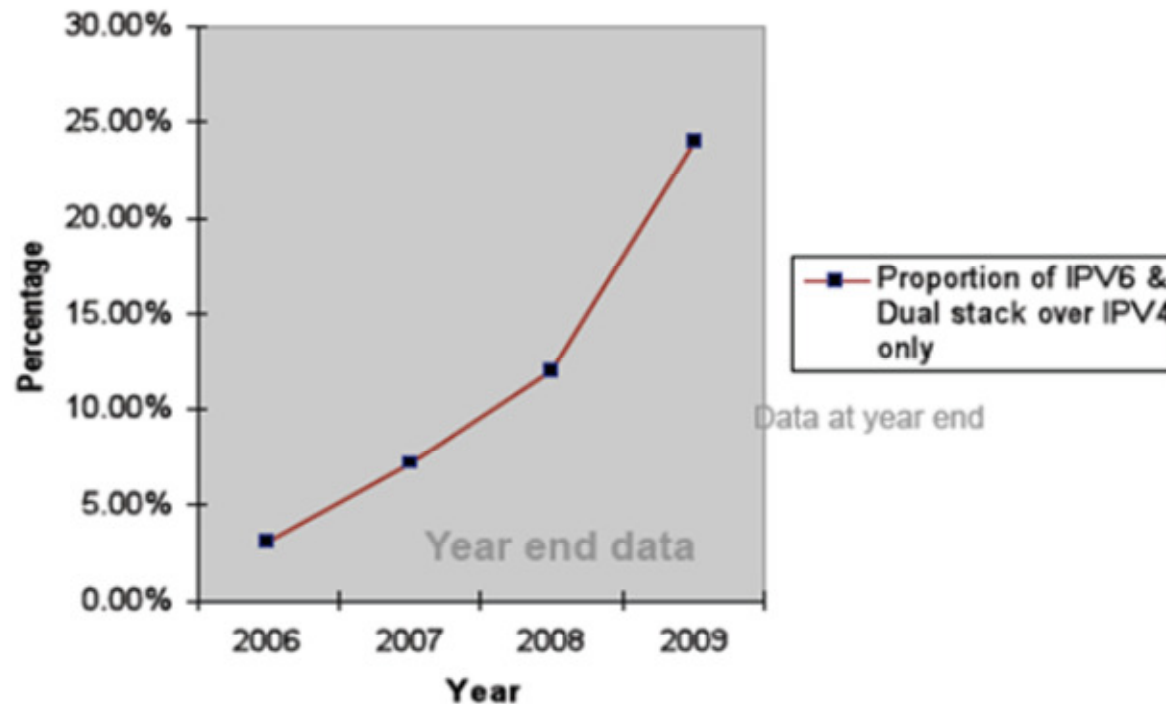
## IPv6 deployment requires the upgrading of all components of the Internet



Source: Red Tech Consulting analysis

# Red Tech Consulting

**A number of global Internet backbone providers provide high-speed IPv6 and dual stack transit**

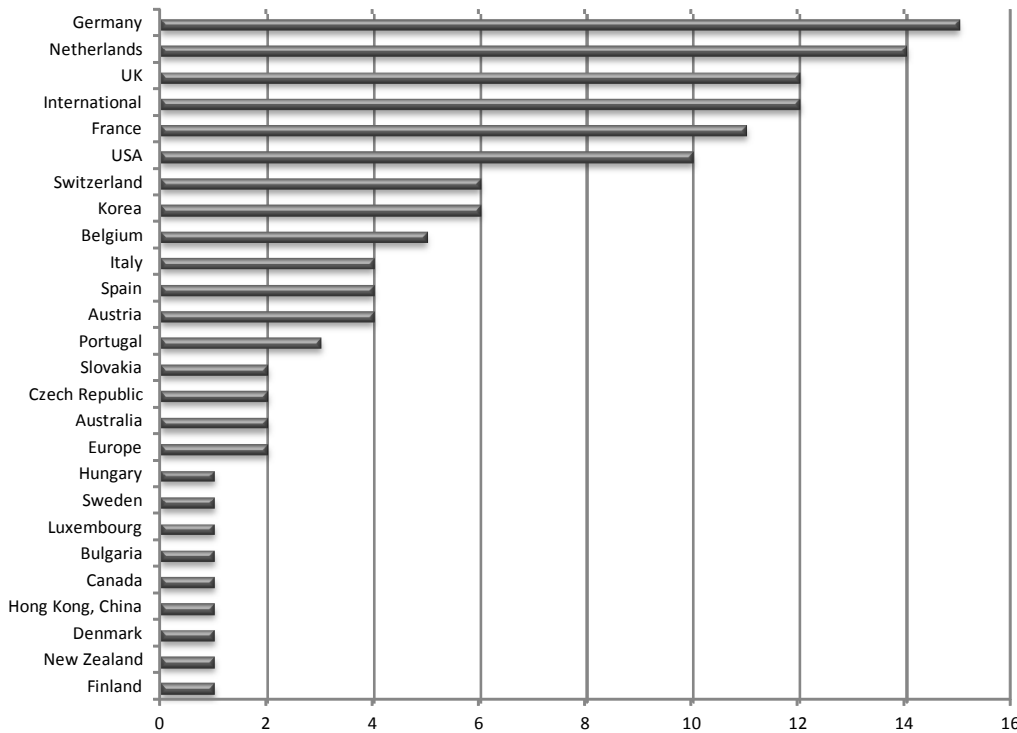


**In June 2010, Tata Communications announced that 32% of its connections globally were dual stack**

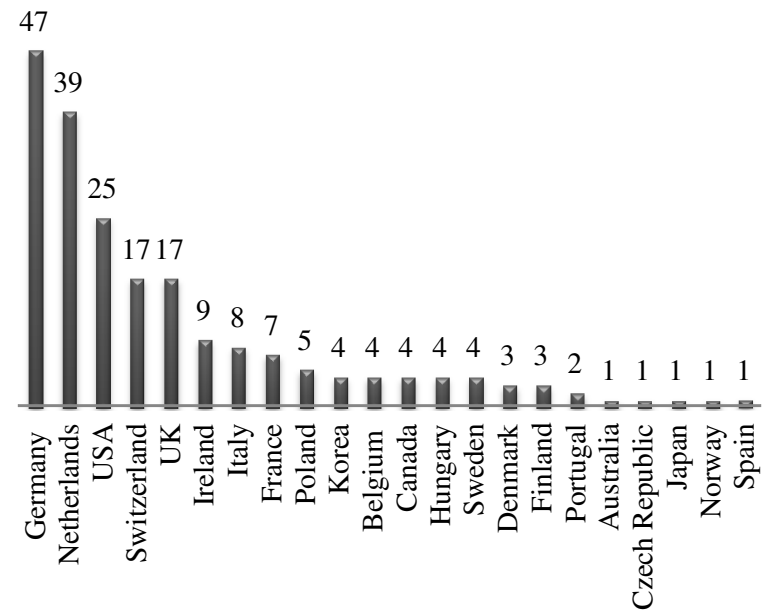
Source: Tata Communications 2010

## Many operators provide IPv6 national transit services and enter IPv6 peering agreements

Providers of native IPv6 transit per country



Number of IPv6 peers per country



**Germany, Netherlands, USA and Switzerland are the top OECD countries in term of IPv6 peers**

Source: OECD April 2010

**Today, 26.8% of Internet Exchanges (IXPs) support IPv6,  
up from 17% in June 2008**

<b>IXPs</b>	
Number of countries with an IXP	89
Number of countries without an IXP	158
Number of IXPs	343

<b>% of IXPs supporting IPv6</b>	
Worldwide	26.8% (92 out of 343)
By region	
•North America	16.1% (14 out of 87 IXPs)
•Asia Pacific	27.7% (20 out of 72 IXPs)
•Latin America	29.0 % (9 out of 31 IXPs)
•Europe & Middle East	33.8% (44 out of 130 IXPs)
•Africa	21.7% (5 out of 23 IXPs)

**Saudi Arabia would benefit from setting up 1 or several IXPs with IPv6 capabilities**

Source: Red Tech Consulting analysis

# Red Tech Consulting

**National Research and Education Networks (NRENs) represent great opportunities to develop skills and validate solutions related to IPV6**

<b>NRENs</b>	
Number of countries with a NREN	108
Number of countries without a NREN	139
Number of NRENs	118

<b>% of NRENs supporting IPv6</b>	
Worldwide	49.2% (58 out of 118)
By region	
•North America	100% (4 out of 4 NRENs)
•Asia Pacific	55.5% (10 out of 18 NRENs)
•Latin America	38.9% (7 out of 18 NRENs)
•Europe & Middle East	62.7% (37out of 59 NRENs)
•Africa	0% (0 out of 19 NRENs)

**Saudi Arabia would benefit from joining the NREN community**

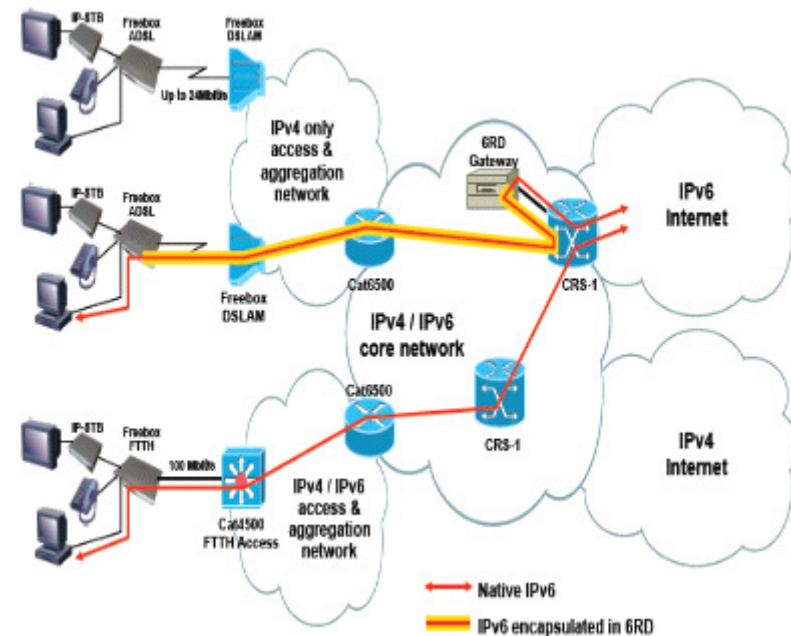
Source: Red Tech Consulting analysis

# Red Tech Consulting

**Free.fr implemented 6rd in 2007, making France the country with the highest deployment of non-relay IPv6 (over 1%)**

✚ 6rd is a mechanism that ensures the rapid deployment on IPv4 infrastructures

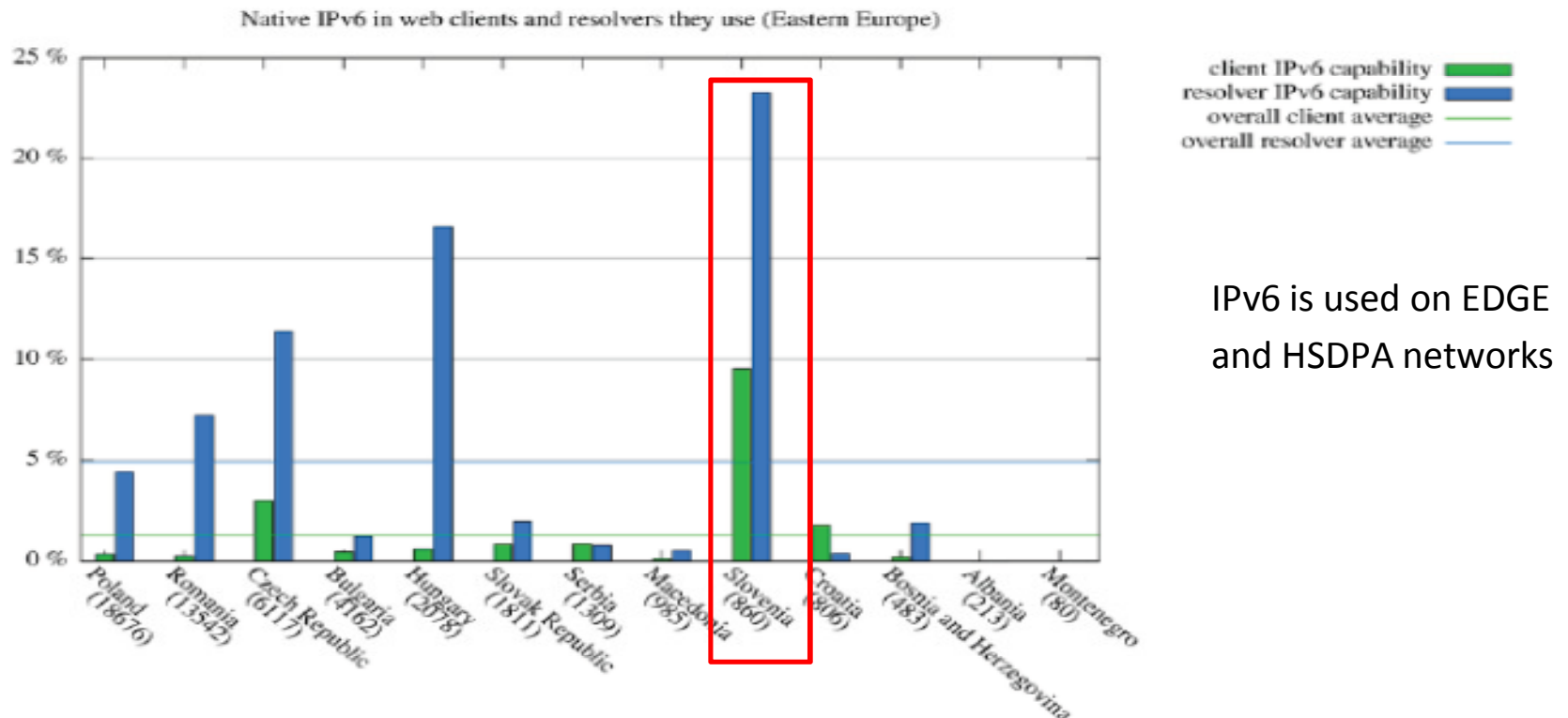
- 6rd became **RFC 5569** in January 2010
- Chosen by **Yahoo Broadband**
  - Implementation cost = 0.13\$/subscriber (based on a 1 million subscribers test)
  - Time to implement = 5 weeks
- **Comcast** has also been trying 6rd in 2010



**Saudi fixed providers might wish to investigate the 6rd solution**

Source: Free.fr, Comcast 2010, Yahoo Broadband 2010, OECD April 2010

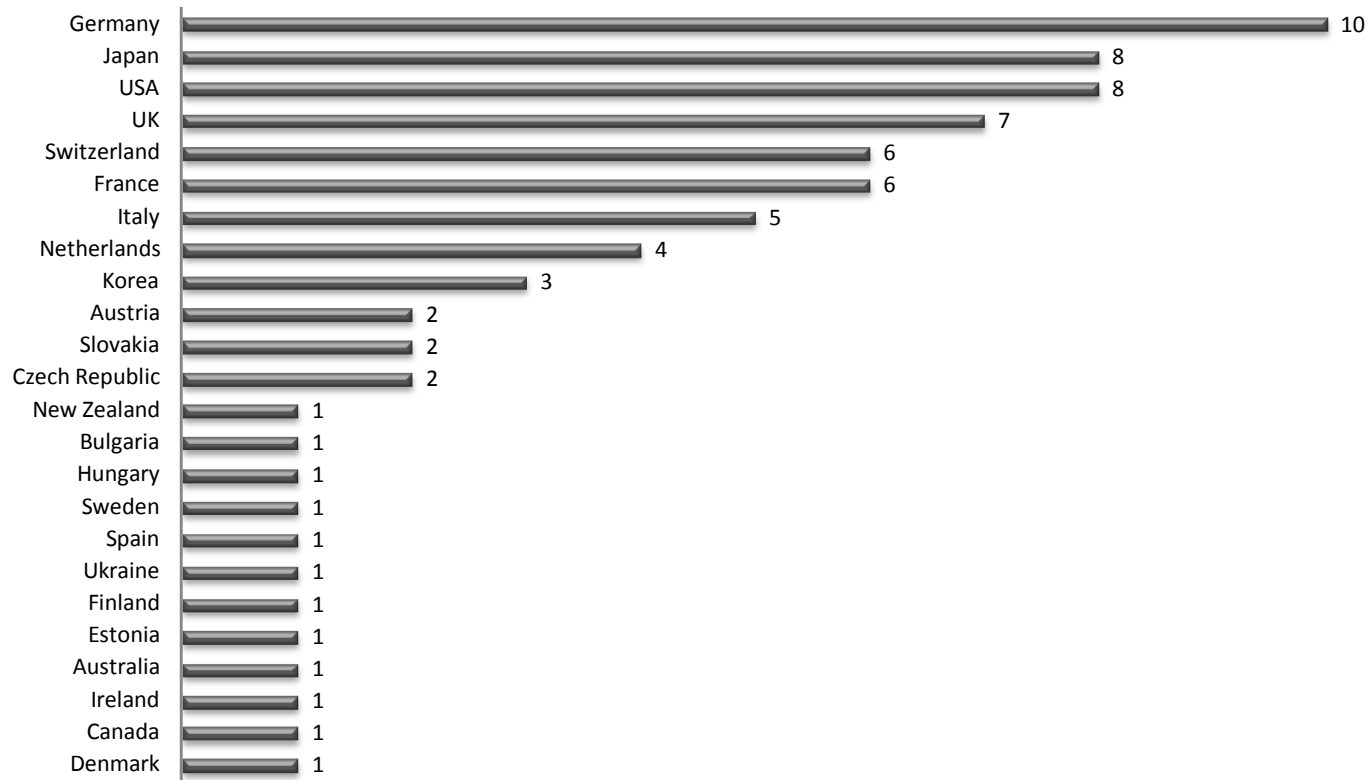
## Cooperation between the two largest mobile service providers in Slovenia led to the highest IPv6 penetration in Europe



On a global basis, IPv6 usage is going to increase rapidly in mobile networks due to LTE deployments (Verizon Wireless)

Source: Zavod Go6, Jan Zorz 2010

## A number of ISPs offer commercial native IPv6 services



**But the issue is more about the lack of content,  
which can be accessed through an IPv6 network**

Source: OECD April 2010

## Major issue is the lack of content, which can be accessed through an IPv6 network

- ✚ Major content providers (Google, YouTube, Facebook, eBay) have just been IPv6 enabled
- ✚ At least 1.5 million domain names, roughly 1% of registered domain names, have IPv6 DNS records.
- ✚ Some 1.45% of the top one thousand websites (ranked by Alexa) have an IPv6 website.
- ✚ Only 0.15% of the top one million websites (ranked by Alexa) have an IPv6 website, of which the content was mostly identical to the IPv4 content.

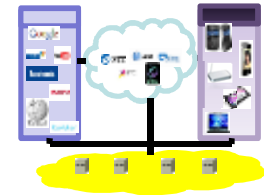


**IPv6 represents an opportunity for the Saudi and Arabic hosting and content industry**

Source: OECD April 2010, Alexa 2010

## Inclusion of IPv6 support at various levels of the DNS is critical to IPv6 adoption

- ✚ 7 out of 13 of the root DNS servers are accessible over IPv6 (6 since January 2008)
- ✚ 65% of TLDs have IPv6 records (IPv6 glue) in the root zone in January 2010, i.e. 182 TLDs have IPv6 records while the other 98 do not.
  - 62% (152 out of 248) of the ccTLD name servers have IPv6 records.
  - 75% (15 out of 20) of the gTLD name servers have IPv6 records.
- ✚ 80% of TLDs have name servers with an IPv6 address



**DNS infrastructure current state does not prevent further IPv6 deployment**

Source: OECD April 2010

## Currently, approximately 25% of operating systems would work with IPv6 by default

- ✚ Migration from Windows XP to Windows 7 will help greatly
- ✚ IPv6 support on smartphones is yet to be confirmed

	January 2010	IPv6 traffic enabled by default	IPv6 support
Windows XP	67.81%	No	Extra configuration line
Windows Vista	17.87%	√	
Windows 7	5.68%	√	
Mac OS X	5.11%	√	
LINUX	1.01%	√	In most configurations
Windows 2000	0.62%	No	
Java ME	0.53%	No	Some APIs enable to specify IPv6 functionality
iPhone	0.43%	No	
Symbian	0.23%	√	
Windows NT	0.10%	No	
Windows 98	0.09%	No	
iPod	0.09%	No	

	January 2010	IPv6 traffic enabled by default	IPv6 support
X11	0.07%	No	
Windows CE	0.05%	No	Yes, CE 4.2 and Windows Mobile, Windows CE version 7, dependant on product/vendor
Windows ME	0.05%	No	Add-on IPv6 implementation
Unknown	0.05%	No	
BlackBerry	0.03%	No	
PLAYSTATION 3	0.03%	No	
Android 1.6	0.02%	√, in progress	
FreeBSD	0.01%	No	

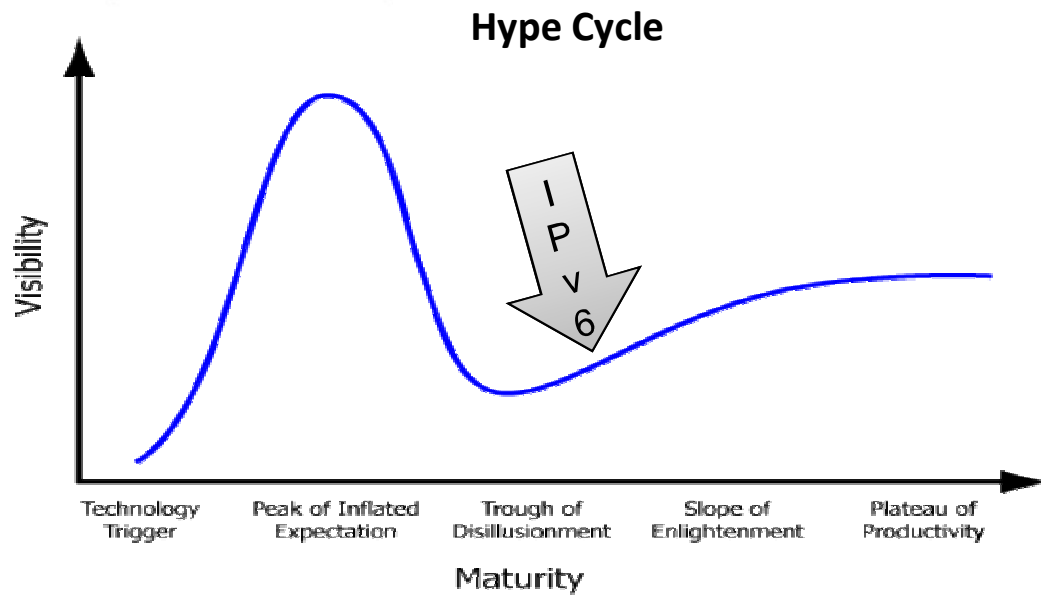
**Home gateways, firewalls and load balancers might require forklift upgrade**

Source: Hitwise Jan 2010

## IPv6 Current State



Rogers Adoption/Innovation Curve



# Questions?

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